

Index

- accelerated failure time model, 154
- actuarial estimate, 46
- additive model, 158, 159, 160, 165, 174, 175, 176, 193, 195, 200, 201, 207, 210, 215
- additive proportional hazards model, 156
- adjusted rate, 107
- age-specific mortality rate, 27, 29, 30, 31
- age-specific rate 107
- analytic function, 53
- approximate average rate, 6
- assumption-free, 184
- average approximate rate, 7, 8, 10
- average mortality rate 9, 19, 20, 37
- average rate, 4

- baseline hazard function, 144, 147, 162, 191, 202, 215, 216
- baseline hazard rate, 137
- baseline survival function, 177
- bias, 17, 47, 77, 85, 96, 113, 197
- binary variable, 196
- binomial distribution, 11, 12, 66, 71, 79

- censored, 75, 95, 96, 130, 131, 132, 135, 189, 198
- censored observation, 73, 78
- centered variable, 191
- chi-square distribution, 61, 63, 135, 142, 153, 188, 200
- chi-square test, 134, 136, 149
- clinical life table, 42
- Cochran–Mantel–Haenszel test, 133
- cohort life table, 27
- commensurate, 175
- complete life table, 27

- complete observation, 73, 78
- conditional probability, 10, 22, 28, 31, 92
- conditional probability of death, 37, 45, 69, 78
- conditional survival probability, 68, 69, 79, 87, 93, 107
- confidence band, 83
- confidence interval, 14, 17, 24, 46, 57, 66, 80, 81, 83, 85, 86, 96, 98, 100, 101, 104, 105, 114, 115, 119, 122, 125, 141, 142, 190
- confounding, 172, 194, 195, 196
- constant of proportionality, 155
- Cox, D., 184
- Cox–Snell residual value, 178, 179, 180, 182, 205
- crude mortality rate, 21, 35, 36
- cumulative disease incidence, 87
- cumulative hazard function, 87, 121, 123
- cumulative probability, 71
- current life table, 27, 35
- current mortality rate, 30, 31, 42
- current status data, 76

- delta method, 65
- dependent variables, 155
- derivative, 2, 25, 64, 65
- distribution-free, 130
- distributions
 - binomial distribution, 11, 12, 66, 71, 79
 - chi-square distribution, 61, 63, 135, 142, 153, 188, 200
 - exponential distribution, 90, 91, 94, 96, 100, 119, 206
 - normal distribution, 12, 14, 15, 24, 65, 80, 97, 100, 101, 105, 113, 115, 141, 142, 147
 - Poisson distribution, 65, 66
 - Weibull probability distribution, 111, 144

280 Index

- effective number, 45, 46
 effect measure modification, 171
 estimation
 actuarial estimate, 4
 Kaplan–Meier estimate, 70
 least squares estimation, 11, 151, 206, 216
 maximum likelihood estimation, 53, 54, 56, 57, 58, 96, 98, 101, 113, 114, 115, 139, 146, 162, 167, 187, 188, 190
 model-free estimate, 73, 120, 121, 173
 nonparameteric estimate, 73
 partial likelihood estimation, 187, 189, 191, 193, 198, 216
 product-limit estimation, 70, 72, 75, 79, 84, 85, 87, 89, 90, 102, 103, 116, 119, 121, 122, 129, 130, 144, 185, 202, 203, 205, 216
 expectation of life, 29
 expected value, 133
 exponential distribution, 90, 91, 94, 96, 100, 119, 206
 exponential function, 90, 103
 exponential model, 137, 144
 extended model, 215
- failure rate, 3
 Fisher's exact test, 133
 follow-up data, 42
 force of mortality, 3
- gamma function, 116
 goodness-of-fit, 103, 119, 123, 143, 160, 178, 205, 207
 Gossett, W. S., 129
 Graunt, J., 27, 39, 42
 Greenwood, M., 79
 Greenwood's variance, 46, 79, 80, 86, 88, 123
- Halley, E., 27
 Harrell, F., 183
 hazard function, 37, 49, 86, 87, 111, 114, 121, 123, 144, 185, 198
 hazard rate, 3, 20, 23, 26, 37, 47, 91, 93, 94, 96, 98, 100, 111, 113, 125, 137, 140, 170, 171, 173, 174
 hazard ratio, 147, 149, 151, 153, 155, 156, 158, 159, 162, 169, 176, 190, 193, 201, 213
 heterogeneity, 16, 17
- incomplete survival time, 44
 independent variable, 155
 index plot, 209
 instantaneous rate, 3
 interaction, 171, 192, 199, 200, 212, 213, 214
 interval censored, 76
 inverse function, 125
 inverse Weibull survival function, 117
- Kaplan–Meiers estimate, 70
- least squares estimation, 116, 151, 206, 216
 left censored, 76
 length bias, 76
 life mortality rate, 30
 life table, 68
 likelihood function, 54, 56, 57, 58, 59
 likelihood ratio test, 59, 63, 124, 142, 149, 171, 193, 199
 likelihood value, 57
 linear interpolation, 72
 linear regression model, 136
 logistic model, 146
 logistic transformation, 13, 15
 logit, 13
 log-likelihood function, 55, 56
 log-likelihood value, 59, 60, 61, 62, 63, 123, 142, 149, 151, 153
 log-log transformation, 103, 115, 143, 151, 181, 206, 207, 216
 log-odds, 13
 log-rank test, 129, 135, 188, 189
- maximum likelihood estimation, 53, 54, 56, 57, 58, 96, 98, 101, 113, 114, 115, 139, 146, 162, 167, 187, 188, 190
 mean additional years, 35, 42
 mean lifetime, 38, 39
 mean moving average, 51
 mean number of deaths, 4, 7, 8
 mean survival time 4, 7, 8, 20, 21, 23, 30, 72, 83, 84, 95, 96, 97, 98, 102, 116, 138, 140, 148
 median moving average, 51
 median survival time, 22, 85, 86, 100, 101, 116, 117, 119, 140, 148, 166, 168, 175, 212
 median time of death, 72
 Miller, R., 180

281 **Index**

- model-free estimate, 73, 120, 121, 173
- models
 - accelerated failure time model, 154
 - additive model, 158, 159, 160, 165, 174, 175, 176, 193, 195, 200, 201, 207, 210, 215
 - additive proportional hazards model, 155
 - exponential model, 137, 144
 - extended model, 215
 - linear regression model, 136
 - logistic model, 146
 - multivariable additive proportional hazards model, 198
 - multivariable hazards model, 156, 168, 184
 - multivariable model, 172
 - multivariable regression model, 157
 - nested two-sample model, 193
 - nonadditive model, 170, 171, 173
 - two-sample model, 202
 - two-sample proportional hazards model, 138, 187
 - Weibull hazards model, 155
- modified Cox–Snell residual value, 180, 210
- mortality function, 87
- mortality rate, 8, 21, 34, 107
- multivariable additive proportional hazards model, 198
- multivariable hazards model, 156, 168, 184
- multivariable model, 172
- multivariable regression model, 157

- nested model, 62
- nested two-sample model, 193
- Newton, I., 1
- nominal variable, 163, 164, 165
- nonadditive model, 170, 171, 173
- noninformative, 75, 96, 189, 198
- nonparametric analysis, 202
- nonparameteric estimate, 73
- normal distribution, 12, 14, 15, 24, 65, 80, 97, 100, 101, 105, 113, 115, 141, 142, 147

- odds ratio, 146

- parametric analysis, 202
- partial likelihood estimation, 187, 189, 191, 193, 198, 216
- percentile, 116, 117, 118

- pointwise confidence interval, 83
- Poisson distribution, 65, 66
- probability, 9, 10
- probability of death, 11, 16, 17, 22, 23, 28, 31, 45, 107, 108
- product-limit estimation, 70, 72, 75, 79, 84, 85, 87, 89, 90, 102, 103, 116, 119, 121, 122, 129, 130, 144, 185, 202, 203, 205, 216
- product-limit table, 84, 86
- properties of variance, 110
- proportional hazard function, 137

- quantile plot, 83

- radix, 28
- randomization, 158
- rates
 - adjusted rate, 107
 - age-specific mortality rate, 27, 29, 30, 31
 - age-specific rate, 107
 - approximate average rate, 6
 - average approximate rate, 7, 8, 10
 - average mortality rate, 9, 19, 20, 37
 - average rate, 4
 - baseline hazard rate, 137
 - crude mortality rate, 21, 35, 36
 - current mortality rate, 30, 31, 42
 - exponential model, 137, 144
 - failure rate, 3
 - hazard rate, 3, 20, 23, 26, 37, 47, 91, 93, 94, 96, 98, 100, 111, 113, 125, 137, 140, 170, 171, 173, 174
 - instantaneous rate, 3
 - mortality rate, 8, 21, 34, 107
 - relative rate, 3
- regression coefficients, 198, 212, 215
- relative hazard ratio, 157, 160
- relative rate, 3
- residual value, 178, 179, 180, 181, 209

- scale parameter, 111, 125, 150, 163, 167, 169, 177
- score likelihood test, 189
- semiparametric, 156, 185
- shape parameter, 111, 150, 151, 153, 162, 174, 177, 190, 201
- significance probability, 15
- smoothing technique, 51

282 Index

- statistical power, 197
- statistical test, 57, 66, 119, 216
- step function, 71, 122
- stratified analysis, 215
- survival function, 1, 2, 3, 4, 5, 18, 26, 36, 49, 51, 83, 91, 114, 116, 130, 177, 202, 204
- survival probability, 19, 23, 36, 45, 47, 50, 68, 70, 71, 72, 75, 77, 79, 80, 83, 90, 93, 103, 116, 129, 136, 144
- Taylor series expansion, 65
- test statistic, 61
- tests
 - chi-square test, 134, 136, 149
 - Cochran–Mantel–Haenszel test, 133
 - Fisher’s exact test, 133
 - likelihood ratio test, 59, 63, 124, 142, 149, 171, 193, 199
 - log-rank test, 129, 135, 188, 189
 - score likelihood test, 189
 - statistical test, 57, 66, 119, 216
 - test statistic, 61
 - two-sample test, 146
 - Wald’s test, 58, 71, 174, 175, 188, 193
- total survival time, 29, 30
- transformation, 13, 66, 81, 96, 97, 103, 120, 121, 178, 210, 216
- two-sample model, 202
- two-sample proportional hazards model, 138, 187
- two-sample test, 146
- uniform risk, 17
- Wald’s test, 58, 171, 174, 175, 188, 193
- Weibull hazards model, 155
- Weibull probability distribution, 111, 144
- Weibull survival function, 106